DRINKING WATER SURVEILLANCE PROGRAM

BRANTFORD WATER TREATMENT PLANT

ANNUAL REPORT 1990

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BRANTFORD
WATER TREATMENT PLANT

DRINKING WATER SURVEILLANCE PROGRAM

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EXECUTIVE SUMMARY

DRINKING WATER SURVEILLANCE PROGRAM

BRANTFORD WATER TREATMENT PLANT
1990 ANNUAL REPORT

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1990, 76 systems were being monitored.

The Brantford water treatment plant is a conventional treatment plant which treats water from the Grand River via the Homedale Canal. The process consists of coagulation, flocculation, sedimentation, filtration, taste and odour control, fluoridation and disinfection. This plant has a rated capacity of 104.0 x 1000 m^3/day. The Brantford water treatment plant serves a population of approximately 75,100.

Water at the plant and at two locations in the distribution system was sampled for the presence of approximately 180 parameters. Parameters were divided into the following groups: bacteriological, inorganic and physical (laboratory chemistry, field chemistry and metals), and organic (chloroaromatics, chlorophenols, pesticides and PCB, phenolics, polyaromatic hydrocarbons, specific pesticides and volatiles). Samples were analyzed for specific pesticides and chlorophenols twice a year in the spring and fall.

Table A is a summary of all results by group.

No known health related guidelines were exceeded.

The Brantford water treatment plant, for the sample year 1990, produced good quality water and this was maintained in the distribution system.

TABLE A

DRINKING WATER SURVEILLANCE PROGRAM BRANTFORD WTP

SUMMARY TABLE BY SCAN

A POSITIVE VALUE DENOTES THAT THE RESULT IS GREATER THAN THE STATISTICAL LIMIT OF DETECTION AND IS QUANTIFIABLE
A '.' INDICATES THAT NO SAMPLE WAS TAKEN

SCAN	SITE	RAW		TREATED			SITE 1			SITE 2		
	TESTS	POSITIVE	%POSITIVE	TESTS	POSITIVE	%POSITIVE	TESTS	POSITIVE	%POSITIVE	TESTS	POSITIVE	%POSITIVE
BACTERIOLOGICAL	18	17	94	6	0	0	5	2	40	6	5	83
CHEMISTRY (FLD)	17	17	100	32	32	100	40	35	87	64	54	84
CHEMISTRY (LAB)	132	125	94	132	115	87	190	183	96	228	223	97
METALS	144	73	50	144	62	43	230	128	55	276	156	56
CHLOROAROMATICS	84	0	0	84	0	0	56	0	0	84	0	0
CHLOROPHENOLS	12	0	0	12	0	0	.	.	.	.	.	.
PAH	102	0	0	102	0	0	17	0	0	17	0	0
PESTICIDES & PCB	205	0	0	205	0	0	85	0	0	128	0	0
PHENOLICS	6	2	33	6	2	33	.	.	.	.	.	.
SPECIFIC PESTICIDES	55	0	0	55	0	0	4	0	0	6	0	0
VOLATILES	174	0	0	174	20	11	145	17	11	174	20	11
TOTAL	949	234		952	231		772	365		983	458	

DRINKING WATER SURVEILLANCE PROGRAM

BRANTFORD WATER TREATMENT PLANT
1990 ANNUAL REPORT

INTRODUCTION

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1990, 76 systems were being monitored.

Appendix A has a full description of the DWSP.

The DWSP was initiated for the Brantford water treatment plant in winter of 1987. Previous annual reports have been published for 1987, 1988 and 1989.

PLANT DESCRIPTION

The Brantford water treatment plant is a conventional treatment plant which treats water from the Grand River via the Homedale Canal. The process consists of coagulation, flocculation, sedimentation, filtration, taste and odour control, fluoridation and disinfection. This plant has a rated capacity of 104.0 x 1000 m^3/day. The Brantford water treatment plant serves a population of approximately 75,100.

The sample day flows ranged from 46.1 x 1000 m^3/day to 53.1 x 1000 m^3/day.

General plant information is presented in Table 1 and a schematic of plant processes, chemical addition points and sampling locations in Figure 1.

SAMPLING AND ANALYSES

Sample lines in the plant were flushed prior to sampling to ensure that the water obtained was indicative of its origin and not residual water standing in the sample line.

At all distribution system locations two types of samples were obtained, a standing and a free flow. The standing sample consisted of water that had been in the household plumbing and service connection for a minimum of six hours. These samples were used to make an assessment of the change in the levels of inorganic compounds and metals, due to leaching from, or deposition on, the

plumbing system. The only analyses carried out on the standing samples therefore, were General Chemistry and Metals. The free flow sample represented fresh water from the distribution main, since the sample tap was flushed for five minutes prior to sampling.

Attempts were made to capture the same block of water at each sampling point by taking the retention time into consideration. Retention time was calculated by dividing the volume of water between two sampling points by sample day flow. For example, if it was determined that retention time within the plant was five hours, then there would be a five hour interval between the raw and treated sampling. Similarly, if it was estimated that it took approximately one day for the water to travel from the plant to the distribution system site, this site would be sampled one day after the treated water from the plant.

Stringent DWSP sampling protocols were followed to ensure that all samples were taken in a uniform manner (see Appendix B).

Plant operating personnel routinely analyze parameters for process control (Table 2).

Water at the plant and at one location in the distribution system was sampled for the presence of approximately 180 parameters. Parameters were divided into the following groups: bacteriological, inorganic and physical (laboratory chemistry, field chemistry and metals), and organic (chloroaromatics, chlorophenols, pesticides and PCB, phenolics, polyaromatic hydrocarbons, specific pesticides and volatiles). Samples were analyzed for specific pesticides and chlorophenols twice a year in the spring and fall. Laboratory analyses were conducted at the Ministry of the Environment facilities in Rexdale, Ontario.

RESULTS

Field measurements were recorded on the day of sampling and were entered onto the DWSP database as submitted by plant personnel.

Table 3 contains information on delay time between raw and treated water sampling, flow rate, and treatment chemical dosages.

Table 4 is a summary break-down of the number of water samples analyzed by parameter and by water type. The number of times that a positive or trace result was detected is also reported.

Positive denotes that the result is greater than the statistical limit of detection established by the Ministry of the Environment laboratory staff and is quantifiable. Trace (<T) denotes that the level measured is greater than the lowest value detectable by the method but lies so close to the detection limit that it cannot be confidently quantified.

Table 5 presents the results for parameters detected on at least one occasion.

Table 6 lists all parameters analyzed in the DWSP.

Associated guidelines and detection limits are also supplied on Tables 5 and 6. Parameters are listed alphabetically within each scan.

DISCUSSION

GENERAL

Water quality was judged by comparison with the Ontario Drinking Water Objectives publication (ODWOs). When an Ontario Drinking Water Objective (ODWO) was not available, guidelines/limits from other agencies were used. These guidelines were obtained from the Parameter Listing System database.

IN THIS REPORT, DISCUSSION IS LIMITED TO:

- **THE TREATED AND DISTRIBUTED WATER;**
- **ONLY THOSE PARAMETERS WITH CONCENTRATIONS ABOVE GUIDELINE VALUES; AND**
- **POSITIVE ORGANIC PARAMETERS DETECTED.**

BACTERIOLOGICAL

Guidelines for bacteriological sampling and testing of a supply are developed to maintain a proper supervision of its bacteriological quality. Routine monitoring programs usually require that multiple samples be collected in a given system. Full interpretation of bacteriological quality cannot be made on the basis of single samples.

Standard plate count is a test used to supplement routine analysis for coliform bacteria. The limit for standard plate count (at 35°C after 48 hours) in the ODWOs is 500 counts/mL (based on a geometric mean of 5 or more samples). DWSP bacteriological analysis of treated and distributed water was limited to standard plate count, which may indicate some deterioration in water quality if the guideline of 500 counts/mL is exceeded.

Standard plate count (membrane filtration) exceeded the ODWO Maximum Desirable Concentration of 500 counts/mL in 4 of 17 treated and distributed water samples with a maximum reported value of 2,400.0 counts/mL.

INORGANIC & PHYSICAL

CHEMISTRY (FIELD)

It is desirable that the temperature of drinking water be less than 15°C. The palatability of water is enhanced by its coolness. A temperature below 15°C will tend to reduce the growth of nuisance organisms and hence minimize associated taste, colour, odour and corrosion problems. The temperature of the delivered water may increase in the distribution system due to the warming effect of the soil in late summer and fall and/or as a result of higher temperatures in the source water.

Field temperature exceeded the ODWO Maximum Desirable Concentration of 15°C in 7 of 16 treated and distributed water samples with a maximum reported value of 25.0°C.

CHEMISTRY (LAB)

Colour in drinking water may be due to the presence of natural or synthetic substances as well as certain metallic ions.

Colour exceeded the ODWO Maximum Desirable Concentration of 5 HZU in 13 of 17 treated and distributed water samples with a maximum reported value of 12.5 HZU.

Dissolved organic carbon exceeded the ODWO Maximum Desirable Concentration of 5.0 mg/L in 4 of 17 treated and distributed water samples with a maximum reported value of 6.1 mg/L.

The ODWOs indicate that a hardness level of between 80 and 100 mg/L as calcium carbonate for domestic waters provides an acceptable balance between corrosion and encrustation. Water supplies with a hardness greater than 200 mg/L are considered poor and would possess a tendency to form scale deposits and result in excessive soap consumption.

Hardness exceeded the ODWO Aesthetic or Recommended Operational Guideline of 80-100 mg/L in 17 of 17 treated and distributed water samples with a maximum reported value of 320.0 mg/L.

Elevated conductivity is often associated with high hardness levels.

Conductivity exceeded the European Economic Community (EEC) Aesthetic Guideline Level of 400 umho/cm in 17 of 17 treated and distributed water samples with a maximum reported value of 769.0 umho/cm.

Total ammonium exceeded the EEC Aesthetic Guideline Level of 0.05 mg/L in 13 of 17 treated and distributed water samples with a maximum reported value of 0.2 mg/L.

The Brantford water treatment plant uses ammonia to produce a chloramine in the disinfection process which explains the levels above the aesthetic guideline.

METALS

At present, there is no evidence that aluminum is physiologically harmful and no health limit for drinking water has been specified. The measure of aluminum in treated water is important to indicate the efficiency of the treatment process. The ODWOs indicate that a useful guideline is to maintain a residual below 100 ug/L as aluminum in the water leaving the plant, to avoid problems in the distribution system.

Aluminum exceeded the ODWO Aesthetic or Recommended Operational Guideline of 100 ug/L in 5 of 17 treated and distributed water samples with a maximum reported value of 190.0 ug/L.

ORGANIC

CHLOROAROMATICS

The results of the chloroaromatic scan showed that none were detected above trace levels.

CHLOROPHENOLS

The results of the chlorophenol scan showed that none were detected.

POLYAROMATIC HYDROCARBONS (PAH)

The results of the PAH scan showed that none were detected.

PESTICIDES & PCB

The results of the PCB scan showed that none were detected.

The results of the regular pesticide scan showed that none were detected above trace levels.

PHENOLICS

Phenolic compounds are present in the aquatic environment as a result of natural and/or industrial processes. The ODWOs recommend, as an operational guideline, that phenolic substances in drinking water not exceed 2.0 ug/L. This limit has been set primarily to prevent undesirable taste and odours, particularly in chlorinated water. No results exceeded the guideline.

SPECIFIC PESTICIDES

The results of the specific pesticides scan showed that none were detected.

VOLATILES

The detection of benzene, ethylbenzene, toluene and xylenes at low, trace levels may be a laboratory artifact derived from the analytical methodology.

Trihalomethanes (THMs) are produced during the water treatment process and will always occur in chlorinated waters. THMs are comprised of chloroform, chlorodibromomethane and dichlorobromomethane; bromoform occurs occasionally. Results are reported for the individual compounds as well as for total THMs. Only total THMs results are discussed.

Total THMs were found at positive levels in 17 treated and distributed water samples analyzed with a maximum level of 188.10 ug/L. This was below the ODWO Maximum Acceptable Concentration of 350 ug/L.

CONCLUSIONS

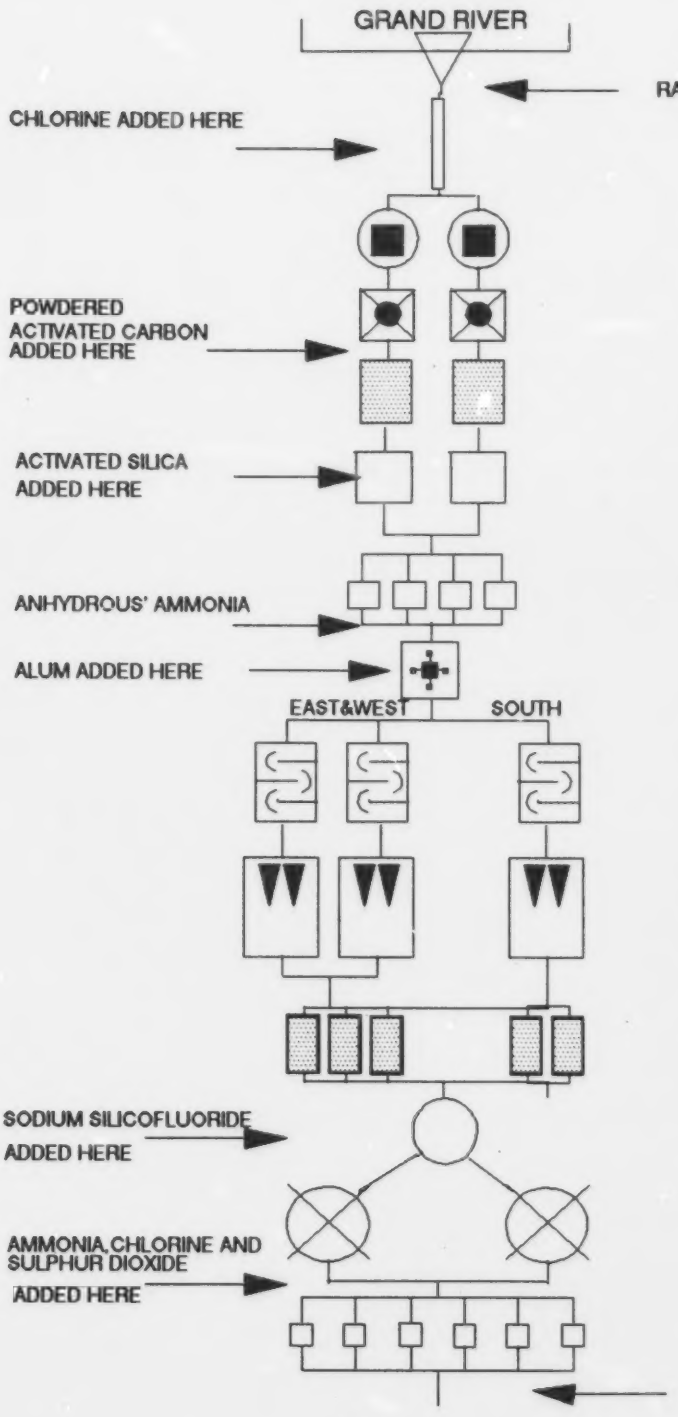
The Brantford water treatment plant, for the sample year 1990, produced good quality water and this was maintained in the distribution system.

No known health related guidelines were exceeded.

FIGURE 1

BRANTFORD WTP

SCHEMATIC



CHARACTERISTICS

RAW WATER SAMPLE SITE

1 INTAKE PIPE

2 SURGE & SCREEN WELLS

2 PRE-TREATMENT CELLS

2 CARBON CONTACT CHAMBERS

2 LOWLIFT CHAMBERS

4 LOWLIFT PUMPS

1 FLASH MIXER CHAMBER

3 FLOCCULATION TANKS

3 SEDIMENTATION TANKS

5 FILTERS

1 CLEARWELL

2 RESERVOIRS

6 HIGHLIFT PUMPS

TREATED WATER SAMPLE SITE

TABLE 1

DRINKING WATER SURVEILLANCE PROGRAM

PLANT GENERAL REPORT

WORKS #: 220003564
PLANT NAME: BRANTFORD WTP

DISTRICT: CAMBRIDGE
REGION: WEST CENTRAL
DISTRICT OFFICER :J. VOGT

UTM #: 175572904776300

PLANT SUPERINTENDENT: WAYNE CARMICHAEL

ADDRESS: 324 GRAND RIVER AVENUE
BRANTFORD,ONTARIO
N3T 4Y8
(519-753-7391)

MUNICIPALITY: BRANTFORD
AUTHORITY: MUNICIPAL

PLANT INFORMATION

PLANT VOLUME:	-	(X 1000 M3)
DESIGN CAPACITY:	90.000	(X 1000 M3/DAY)
RATED CAPACITY:	104.000	(X 1000 M3/DAY)

MUNICIPALITY	POPULATION
CITY OF BRANTFORD	75,080

TABLE 2
DRINKING WATER SURVEILLANCE PROGRAM
IN-PLANT MONITORING

PARAMETER	LOCATION	FREQUENCY
FREE CHLORINE RESIDUAL	RAW WATER	CONTINUOUS
	TREATED WATER	CONTINUOUS
PH	FILTERED WATER IN LAB	CONTINUOUS
TURBIDITY	CHLORINE EFFLUENT	CONTINUOUS
	RAW WATER	CONTINUOUS
	TREATED WATER	CONTINUOUS

TABLE 3

DRINKING WATER SURVEILLANCE PROGRAM BRANTFORD WTP SAMPLE DAY CONDITIONS FOR 1990

			TREATMENT CHEMICAL DOSAGES (MG/L)						
			PRE CHLORINATION	CHLORAMINATION	COAGULATION	COAGULATION AID	ACTIVATION	FLUORIDATION	POST CHLORINATION
			CHLORINE	AMMONIUM ANHYDROUS	ALUM LIQUID	SODIUM SILICATE	SULPHURIC ACID	SODIUM SILICOFLUORIDE	CHLORINE
DATE	DELAY * TIME(HRS)	FLOW (1000M3)							
FEB 27	5.00	.000	9.76	.30	35.00	7.00	3.16	1.00	.04
APR 25	3.00	46.100	7.79	.21	15.00	5.00	2.00	1.00	.10
JUN 26	4.00	53.100	8.70	.19	20.00	7.00	1.70	1.00	.06
AUG 27	6.00	.000	9.20	.18	20.00	6.00	1.81	1.00	.10
OCT 23	6.00	.000	8.30	.19	25.00	7.00	1.92	1.00	.04

* THE DELAY TIME BETWEEN THE RAW AND TREATED WATER SAMPLING, SHOULD ESTIMATE THE RETENTION TIME.

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM BRANTFORD WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
BACTERIOLOGICAL												
FECAL COLIFORM MF	6	6	0	.	.	.	.	.	.	.	.	.
STANDRD PLATE CNT MF	.	.	.	6	0	0	5	2	0	6	5	0
TOTAL COLIFORM MF	6	5	0	.	.	.	.	.	.	.	.	.
Y COLIFORM BCKGRD MF	6	6	0	.	.	.	.	.	.	.	.	.
*TOTAL GROUP BACTERIOLOGICAL	18	17	0	6	0	0	5	2	0	6	5	0
CHEMISTRY (FLD)												
FLD CHLORINE (COMB)	.	.	.	6	6	0	6	6	0	10	10	0
FLD CHLORINE FREE	.	.	.	3	3	0	6	1	0	10	0	0
FLD CHLORINE (TOTAL)	.	.	.	6	6	0	6	6	0	10	10	0
FLD PH	5	5	0	5	5	0	6	6	0	10	10	0
FLD TEMPERATURE	6	6	0	6	6	0	8	8	0	12	12	0
FLD TURBIDITY	6	6	0	6	6	0	8	8	0	12	12	0
*TOTAL SCAN CHEMISTRY (FLD)	17	17	0	32	32	0	40	35	0	64	54	0
CHEMISTRY (LAB)												
ALKALINITY	6	6	0	6	6	0	10	10	0	12	12	0
CALCIUM	6	6	0	6	6	0	10	10	0	12	12	0
CYANIDE	6	0	1	6	0	1	.	.	.	.	.	.
CHLORIDE	6	6	0	6	6	0	10	10	0	12	12	0
COLOUR	6	6	0	6	6	0	10	10	0	12	12	0
CONDUCTIVITY	6	6	0	6	6	0	10	10	0	12	12	0
DISS ORG CARBON	6	6	0	6	6	0	10	10	0	12	12	0
FLUORIDE	6	6	0	6	6	0	10	10	0	12	12	0
HARDNESS	6	6	0	6	6	0	10	10	0	12	12	0
IONCAL	6	6	0	6	6	0	10	10	0	12	12	0
LANGELIERS INDEX	6	6	0	6	6	0	10	10	0	12	12	0
MAGNESIUM	6	6	0	6	6	0	10	10	0	12	12	0
SODIUM	6	6	0	6	6	0	10	10	0	12	12	0
AMMONIUM TOTAL	6	5	1	6	6	0	10	7	1	12	9	1
NITRITE	6	6	0	6	2	4	10	6	4	12	10	1
TOTAL NITRATES	6	6	0	6	6	0	10	10	0	12	12	0
NITROGEN TOT KJELD	6	6	0	6	6	0	10	10	0	12	12	0
PH	6	6	0	6	6	0	10	10	0	12	12	0
PHOSPHORUS FIL REACT	6	6	0	6	3	3	.	.	.	.	.	.
PHOSPHORUS TOTAL	6	6	0	6	2	4	.	.	.	.	.	.
SULPHATE	6	6	0	6	6	0	10	10	0	12	12	0
TURBIDITY	6	6	0	6	6	0	10	10	0	12	12	0
*TOTAL SCAN CHEMISTRY (LAB)	132	125	2	132	115	12	190	183	5	228	223	2

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM BRANTFORD WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
METALS												
SILVER	6	0	0	6	0	0	10	0	2	12	0	4
ALUMINUM	6	6	0	6	6	0	10	10	0	12	12	0
ARSENIC	6	0	6	6	0	5	10	0	8	12	0	11
BARIUM	6	6	0	6	6	0	10	10	0	12	12	0
BORON	6	6	0	6	6	0	10	10	0	12	12	0
BERYLLIUM	6	0	2	6	0	2	10	0	4	12	0	5
CADMIUM	6	0	1	6	0	2	10	0	5	12	2	5
COBALT	6	0	6	6	0	5	10	0	8	12	0	10
CHROMIUM	6	0	6	6	0	6	10	0	10	12	0	12
COPPER	6	0	6	6	0	6	10	9	1	12	12	0
IRON	6	6	0	6	0	3	10	2	7	12	0	11
MERCURY	6	0	1	6	0	1	.	.	.	.	.	.
MANGANESE	6	6	0	6	6	0	10	10	0	12	12	0
MOLYBDENUM	6	4	2	6	6	0	10	10	0	12	12	0
NICKEL	6	1	4	6	0	5	10	1	6	12	3	8
LEAD	6	6	0	6	0	6	10	7	3	12	12	0
ANTIMONY	6	2	4	6	2	4	10	9	1	12	9	3
SELENIUM	6	0	0	6	0	2	10	0	6	12	0	4
STRONTIUM	6	6	0	6	6	0	10	10	0	12	12	0
TITANIUM	6	6	0	6	6	0	10	10	0	12	12	0
THALLIUM	6	0	0	6	0	0	10	0	0	12	0	0
URANIUM	6	6	0	6	6	0	10	10	0	12	10	2
VANADIUM	6	6	0	6	6	0	10	10	0	12	12	0
ZINC	6	6	0	6	6	0	10	10	0	12	12	0
*TOTAL SCAN METALS	144	73	38	144	62	47	230	128	61	276	156	75
*TOTAL GROUP INORGANIC & PHYSICAL	293	215	40	308	209	59	460	346	66	568	433	77
CHLOROAROMATICS												
HEXACHLOROBUTADIENE	6	0	0	6	0	0	4	0	0	6	0	0
123 TRICHLOROBENZENE	6	0	0	6	0	0	4	0	0	6	0	0
1234 T-CHLOROBENZENE	6	0	0	6	0	0	4	0	0	6	0	0
1235 T-CHLOROBENZENE	6	0	0	6	0	0	4	0	0	6	0	0
124 TRICHLOROBENZENE	6	0	0	6	0	0	4	0	0	6	0	0
1245 T-CHLOROBENZENE	6	0	0	6	0	0	4	0	0	6	0	0
135 TRICHLOROBENZENE	6	0	0	6	0	0	4	0	0	6	0	0
HCB	6	0	0	6	0	0	4	0	0	6	0	0
HEXACHLOROETHANE	6	0	0	6	0	1	4	0	0	6	0	0
OCTACHLOROSTYRENE	6	0	0	6	0	0	4	0	0	6	0	0
PENTACHLOROBENZENE	6	0	0	6	0	0	4	0	0	6	0	0
236 TRICHLOROTOLUENE	6	0	0	6	0	0	4	0	0	6	0	0
245 TRICHLOROTOLUENE	6	0	0	6	0	0	4	0	0	6	0	0
26A TRICHLOROTOLUENE	6	0	0	6	0	0	4	0	0	6	0	0
*TOTAL SCAN CHLOROAROMATICS	84	0	0	84	0	1	56	0	0	84	0	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM BRANTFORD WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
CHLOROPHENOLS												
234 TRICHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
2345 T-CHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
2356 T-CHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
245-TRICHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
246-TRICHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
PENTACHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
*TOTAL SCAN CHLOROPHENOLS	12	0	0	12	0	0	0	0	0	0	0	0
PAH												
PHENANTHRENE	6	0	0	6	0	0	1	0	0	1	0	0
ANTHRACENE	6	0	0	6	0	0	1	0	0	1	0	0
FLUORANTHENE	6	0	0	6	0	0	1	0	0	1	0	0
PYRENE	6	0	0	6	0	0	1	0	0	1	0	0
BENZO(A)ANTHRACENE	6	0	0	6	0	0	1	0	0	1	0	0
CHRYSENE	6	0	0	6	0	0	1	0	0	1	0	0
DIMETH. BENZ(A)ANTHR	6	0	0	6	0	0	1	0	0	1	0	0
BENZO(E) PYRENE	6	0	0	6	0	0	1	0	0	1	0	0
BENZO(B) FLUORANTHEN	6	0	0	6	0	0	1	0	0	1	0	0
PERYLENE	6	0	0	6	0	0	1	0	0	1	0	0
BENZO(K) FLUORANTHEN	6	0	2	6	0	0	1	0	0	1	0	0
BENZO(A) PYRENE	6	0	0	6	0	0	1	0	0	1	0	0
BENZO(G,H,I) PERYLEN	6	0	0	6	0	0	1	0	0	1	0	0
DIBENZO(A,H) ANTHRAC	6	0	0	6	0	0	1	0	0	1	0	0
INDENO(1,2,3-C,D) PY	6	0	0	6	0	0	1	0	0	1	0	0
BENZO(B) CHRYSENE	6	0	0	6	0	0	1	0	0	1	0	0
CORONENE	6	0	0	6	0	0	1	0	0	1	0	0
*TOTAL SCAN PAH	102	0	2	102	0	0	17	0	0	17	0	0
PESTICIDES & PCB												
ALDRIN	6	0	0	6	0	0	4	0	0	6	0	0
ALPHA BHC	6	0	0	6	0	1	4	0	1	6	0	2
BETA BHC	6	0	0	6	0	0	4	0	0	6	0	0
LINDANE	6	0	2	6	0	2	4	0	3	6	0	4
ALPHA CHLORDANE	6	0	0	6	0	0	4	0	0	6	0	0
GAMMA CHLORDANE	6	0	0	6	0	0	4	0	0	6	0	0
DIELDRIN	6	0	0	6	0	0	4	0	0	6	0	0
METHOXYCHLOR	6	0	0	6	0	0	4	0	0	6	0	0
ENDOSULFAN 1	6	0	0	6	0	0	4	0	0	6	0	0
ENDOSULFAN II	6	0	0	6	0	0	4	0	0	6	0	0
ENDRIN	6	0	0	6	0	0	4	0	0	6	0	0
ENDOSULFAN SULPHATE	6	0	0	6	0	0	4	0	0	6	0	0
HEPTACHLOR EPOXIDE	6	0	0	6	0	0	4	0	0	6	0	0
HEPTACHLOR	6	0	0	6	0	0	4	0	0	6	0	0
MIREX	6	0	0	6	0	0	4	0	0	6	0	0
OXYCHLORDANE	6	0	0	6	0	0	4	0	0	6	0	0
OPDDT	6	0	0	6	0	0	4	0	0	6	0	0
PCB	6	0	0	6	0	0	4	0	0	6	0	0
DDD	6	0	0	6	0	0	4	0	0	6	0	0
PPDDE	6	0	0	6	0	0	4	0	0	6	0	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM BRANTFORD WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
PPDDT	6	0	0	6	0	0	4	0	0	6	0	0
AMETRINE	6	0	0	6	0	0	.	.	.	.	.	.
ATRAZINE	6	0	4	6	0	4	.	.	.	.	.	.
ATRATONE	6	0	0	6	0	0	.	.	.	.	.	.
CYANAZINE (BLADEX)	6	0	0	6	0	0	.	.	.	.	.	.
DESETHYLATRAZINE	6	0	1	6	0	1	.	.	.	.	.	.
D-ETHYL SIMAZINE	5	0	0	5	0	0	.	.	.	.	.	.
PROMETONE	6	0	0	6	0	0	.	.	.	.	.	.
PROPAZINE	6	0	0	6	0	0	.	.	.	.	.	.
PROMETRYNE	6	0	0	6	0	0	.	.	.	.	.	.
METRIBUZIN (SENCOR)	6	0	0	6	0	0	.	.	.	.	.	.
SIMAZINE	6	0	1	6	0	1	.	.	.	.	.	.
ALACHLOR (LASSO)	6	0	0	6	0	0	.	.	.	.	.	.
METOLACHLOR	6	0	0	6	0	0	.	.	.	.	.	.
HEXACLCYCLOPENTADIEN	2	0	0	2	0	0	1	0	1	2	0	1
*TOTAL SCAN PESTICIDES & PCB	205	0	8	205	0	9	85	0	5	128	0	7
PHENOLICS												
PHENOLICS	6	2	3	6	2	2	.	.	.	.	.	.
*TOTAL SCAN PHENOLICS	6	2	3	6	2	2	0	0	0	0	0	0
SPECIFIC PESTICIDES												
TOXAPHENE	6	0	0	6	0	0	4	0	0	6	0	0
2,4,5-T	2	0	0	2	0	0	.	.	.	.	.	.
2,4-D	1	0	0	1	0	0	.	.	.	.	.	.
2,4-DB	2	0	0	2	0	0	.	.	.	.	.	.
2,4 D PROPIONIC ACID	2	0	0	2	0	0	.	.	.	.	.	.
DICAMBA	1	0	0	1	0	0	.	.	.	.	.	.
PICHLORAM	0	0	0	0	0	0	.	.	.	.	.	.
SILVEX	2	0	0	2	0	0	.	.	.	.	.	.
DIAZINON	2	0	0	2	0	0	.	.	.	.	.	.
DICHLOROVOS	2	0	0	2	0	0	.	.	.	.	.	.
CHLORPYRIFOS	2	0	0	2	0	0	.	.	.	.	.	.
ETHION	2	0	0	2	0	0	.	.	.	.	.	.
AZINPHOS-METHYL	0	0	0	0	0	0	.	.	.	.	.	.
MALATHION	2	0	0	2	0	0	.	.	.	.	.	.
MEVINPHOS	2	0	0	2	0	0	.	.	.	.	.	.
METHYL PARATHION	2	0	0	2	0	0	.	.	.	.	.	.
METHYLTRITHION	2	0	0	2	0	0	.	.	.	.	.	.
PARATHION	2	0	0	2	0	0	.	.	.	.	.	.
PHORATE	1	0	0	1	0	0	.	.	.	.	.	.
RELDAN	2	0	0	2	0	0	.	.	.	.	.	.
RONNEL	2	0	0	2	0	0	.	.	.	.	.	.
AMINOCARB	0	0	0	0	0	0	.	.	.	.	.	.
BENOMYL	0	0	0	0	0	0	.	.	.	.	.	.
BUX	0	0	0	0	0	0	.	.	.	.	.	.
CARBOFURAN	2	0	0	2	0	0	.	.	.	.	.	.
CICP	2	0	0	2	0	0	.	.	.	.	.	.
DIALLATE	2	0	0	2	0	0	.	.	.	.	.	.

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM BRANTFORD WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
EPTAM	2	0	0	2	0	0	.	.	.	.	.	.
IPC	2	0	0	2	0	0	.	.	.	.	.	.
PROPOXUR	2	0	0	2	0	0	.	.	.	.	.	.
CARBARYL	2	0	0	2	0	0	.	.	.	.	.	.
BUTYLATE	2	0	0	2	0	0	.	.	.	.	.	.
*TOTAL SCAN SPECIFIC PESTICIDES	55	0	0	55	0	0	4	0	0	6	0	0
VOLATILES												
BENZENE	6	0	0	6	0	1	5	0	1	6	0	1
TOLUENE	6	0	1	6	0	3	5	0	1	6	0	2
ETHYLBENZENE	6	0	0	6	0	3	5	0	3	6	0	3
P-XYLENE	6	0	0	6	0	0	5	0	0	6	0	0
M-XYLENE	6	0	0	6	0	0	5	0	0	6	0	0
O-XYLENE	6	0	0	6	0	0	5	0	1	6	0	0
STYRENE	6	0	1	6	0	4	5	0	5	6	0	4
1,1 DICHLOROETHYLENE	6	0	0	6	0	0	5	0	0	6	0	0
METHYLENE CHLORIDE	6	0	0	6	0	0	5	0	0	6	0	0
T1,2DICHLOROETHYLENE	6	0	0	6	0	0	5	0	0	6	0	0
1,1 DICHLOROETHANE	6	0	0	6	0	0	5	0	0	6	0	0
CHLOROFORM	6	0	3	6	6	0	5	5	0	6	6	0
111, TRICHLOROETHANE	6	0	2	6	0	0	5	0	0	6	0	0
1,2 DICHLOROETHANE	6	0	0	6	0	0	5	0	0	6	0	1
CARBON TETRACHLORIDE	6	0	0	6	0	0	5	0	0	6	0	0
1,2 DICHLOROPROPANE	6	0	0	6	0	0	5	0	0	6	0	0
TRICHLOROETHYLENE	6	0	0	6	0	0	5	0	0	6	0	0
DICHLOROBROMOMETHANE	6	0	0	6	6	0	5	5	0	6	6	0
112 TRICHLOROETHANE	6	0	0	6	0	0	5	0	0	6	0	0
CHLORODIBROMOMETHANE	6	0	0	6	2	4	5	2	3	6	2	4
T-CHLOROETHYLENE	6	0	0	6	0	0	5	0	0	6	0	1
BROMOFORM	6	0	0	6	0	0	5	0	0	6	0	0
1122 T-CHLOROETHANE	6	0	0	6	0	0	5	0	0	6	0	0
CHLOROBENZENE	6	0	0	6	0	0	5	0	0	6	0	0
1,4 DICHLOROBENZENE	6	0	0	6	0	0	5	0	0	6	0	0
1,3 DICHLOROBENZENE	6	0	0	6	0	0	5	0	0	6	0	0
1,2 DICHLOROBENZENE	6	0	0	6	0	0	5	0	0	6	0	0
ETHLYENE DIBROMIDE	6	0	0	6	0	0	5	0	0	6	0	0
TOTL TRIHALOMETHANES	6	0	0	6	6	0	5	5	0	6	6	0
*TOTAL SCAN VOLATILES	174	0	7	174	20	15	145	17	14	174	20	16
*TOTAL GROUP ORGANIC	638	2	20	638	22	27	307	17	19	409	20	23

KEY TO TABLE 5 and 6

A ONTARIO DRINKING WATER OBJECTIVES (ODWO)
1. Maximum Acceptable Concentration (MAC)
1+. MAC for Total Trihalomethanes
2. Interim Maximum Acceptable Concentration (IMAC)
3. Aesthetic Objective (AO)
3*. AO for Total Xylenes
4. Recommended Operational Guideline

B HEALTH & WELFARE CANADA (H&W)
1. Maximum Acceptable Concentration (MAC)
2. Proposed MAC
3. Interim MAC
4. Aesthetic Objective (AO)

C WORLD HEALTH ORGANIZATION (WHO)
1. Guideline Value (GV)
2. Tentative GV
3. Aesthetic GV

D US ENVIRONMENTAL PROTECTION AGENCY (EPA)
1. Maximum Contaminant Level (MCL)
2. Suggested No-Adverse Effect Level (SNAEL)
3. Lifetime Health Advisory
4. EPA Ambient Water Quality Criteria
4T. EPA Ambient Water Quality Criteria for Total PAH

F EUROPEAN ECONOMIC COMMUNITY (EEC)
1. Health Related Guideline Level
2. Aesthetic Guideline Level
3. Maximum Admissable Concentration (MADC)

G CALIFORNIA STATE DEPARTMENT OF HEALTH-GUIDELINE VALUE

I NEW YORK STATE AMBIENT WATER GUIDELINE

N/A NONE AVAILABLE

LABORATORY RESULTS, REMARK DESCRIPTIONS

.	No Sample Taken
BDL	Below Minimum Measurement Amount
<T	Greater Than Detection Limit But Not Confident (SEE INTERPRETATION OF RESULTS ABOVE)
>	Results Are Greater Than The Upper Limit
<=>	Approximate Result
!CS	No Data: Contamination Suspected
!IL	No Data: Sample Incorrectly Labelled
!IS	No Data: Insufficient Sample
!IV	No Data: Inverted Septum
!LA	No Data: Laboratory Accident
!LD	No Data: Test Queued After Sample Discarded
!NA	No Data: No Authorization To Perform Reanalysis
!NP	No Data: No Procedure
!NR	No Data: Sample Not Received
!OP	No Data: Obscured Plate
!QU	No Data: Quality Control Unacceptable
!PE	No Data: Procedural Error - Sample Discarded
!PH	No Data: Sample pH Outside Valid Range
!RE	No Data: Received Empty
!RO	No Data: See Attached Report (no numeric results)
!SM	No Data: Sample Missing
!SS	No Data: Send Separate Sample Properly Preserved
!UI	No Data: Indeterminant Interference
!TX	No Data: Time Expired
A3C	Approximate, Total Count Exceeded 300 Colonies
APL	Additional Peak, Large, Not Priority Pollutant
APS	Additional Peak, Less Than, Not Priority Pollutant
CIC	Possible Contamination, Improper Cap
CRO	Calculated Result Only
PPS	Test Performed On Preserved Sample
RMP	P and M-Xylene Not Separated
RRV	Rerun Verification
RVU	Reported Value Unusual
SPS	Several Peaks, Small, Not Priority Pollutant

UCR		Unreliable: Could Not Confirm By Reanalysis
UCS		Unreliable: Contamination Suspected
UIN		Unreliable: Indeterminate Interference
XP		Positive After X Number Of Hours
T#	(T06)	Result Taken After # Hours

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM BRANTFORD WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
BACTERIOLOGICAL						
FECAL COLIFORM MF (CT/100ML)		DET'N LIMIT = 0		GUIDELINE = 0 (A1)		
FEB	108	.	.	.	.	.
APR	8	.	.	.	.	.
JUN	56	.	.	.	.	.
AUG	228	.	.	.	.	.
OCT	192	.	.	.	.	.
DEC	60	.	.	.	.	.
STANDRD PLATE CNT MF (COUNTS/ML)		DET'N LIMIT = 0		GUIDELINE = 500/ML (A3)		
FEB	.	2 <=>	.	2 <=>	.	1 <=>
APR	.	9 <=>	.	15	.	2400 >
JUN	.	3 <=>	.	1 <=>	.	2400 >
AUG	.	3 <=>	.	35	.	2400 >
OCT	.	2 <=>	.	6 <=>	.	800
DEC	.	9 <=>	.	.	.	34
TOTAL COLIFORM MF (CT/100ML)		DET'N LIMIT = 0		GUIDELINE = 5/100ML(A1)		
FEB	8900	.	.	.	.	.
APR	380	.	.	.	.	.
JUN	180 <=>	.	.	.	.	.
AUG	340	.	.	.	.	.
OCT	1300	.	.	.	.	.
DEC	1300	.	.	.	.	.
T COLIFORM BCKGRD MF (CT/100ML)		DET'N LIMIT = 0		GUIDELINE = N/A		
FEB	44000	.	.	.	.	.
APR	48000 >	.	.	.	.	.
JUN	34000	.	.	.	.	.
AUG	18000	.	.	.	.	.
OCT	30000	.	.	.	.	.
DEC	16000	.	.	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM BRANTFORD WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CHEMISTRY (FLD)						
FLD CHLORINE (COMB) (MG/L)			DET'N LIMIT = 0	GUIDELINE = N/A		
FEB	.	1.000	.500	1.000	.300	.400
APR	.	1.100	.	.	.200	.300
JUN	.	1.000	.	.	.	.
AUG	.	1.100	.400	.700	.300	.300
OCT	.	1.100	.400	.500	.200	.400
DEC	.	1.400	.	.	.300	.300
FLD CHLORINE FREE (MG/L)			DET'N LIMIT = 0	GUIDELINE = N/A		
FEB	.	.	.000	.100	.000	.000
APR	.	.	.	.	.000	.000
JUN	.	.100	.	.	.	.
AUG	.	.	.000	.000	.000	.000
OCT	.	.100	.000	.000	.000	.000
DEC	.	.100	.	.	.000	.000
FLD CHLORINE (TOTAL) (MG/L)			DET'N LIMIT = 0	GUIDELINE = N/A		
FEB	.	1.000	.500	1.100	.300	.400
APR	.	1.100	.	.	.200	.300
JUN	.	1.100	.	.	.	.
AUG	.	1.100	.400	.700	.300	.300
OCT	.	1.200	.400	.500	.200	.400
DEC	.	1.500	.	.	.300	.300
FLD PH (DMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = 6.5-8.5(A4)		
FEB	8.000	7.300	7.400	7.400	7.300	7.300
APR	.	.	.	.	7.700	7.700
JUN	8.300	8.100	.	.	.	.
AUG	8.200	7.600	7.400	7.400	7.600	7.500
OCT	8.000	7.500	7.400	7.400	7.500	7.400
DEC	8.100	7.600	.	.	7.600	7.600
FLD TEMPERATURE (DEG.C)			DET'N LIMIT = N/A	GUIDELINE = 15 (A3)		
FEB	5.000	5.500	10.000	9.000	14.000	8.000
APR	13.000	14.000	.	.	18.000	10.000
JUN	18.000	19.000	19.000	19.000	19.000	18.000
AUG	23.000	25.000	22.000	22.000	21.000	20.000
OCT	13.000	12.500	15.000	13.000	20.000	16.000
DEC	5.000	4.500	.	.	20.000	14.000
FLD TURBIDITY (FTU)			DET'N LIMIT = N/A	GUIDELINE = 1 (A1)		
FEB	17.700	.410	.780	.620	.420	.100
APR	11.300	.230	.	.	.230	.210
JUN	16.500	.200	.250	.270	.270	.230
AUG	11.500	.140	.170	.180	.270	.170
OCT	29.000	.170	.350	.110	.100	.080
DEC	9.000	.300	.	.	.070	.060

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM BRANTFORD WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CHEMISTRY (LAB)						
ALKALINITY (MG/L)			DET'N LIMIT = 0.2	GUIDELINE = 30-500 (A3)		
FEB	178.000	140.800	148.200	149.200	116.600	119.900
APR	188.600	169.600	167.800	167.200	172.000	168.900
JUN	175.500	152.100	154.200	154.400	159.800	159.600
AUG	184.000	159.100	153.400	150.600	173.000	167.300
OCT	223.300	197.700	201.800	190.100	195.900	196.600
DEC	247.100	225.400	.	.	223.500	222.600
CALCIUM (MG/L)			DET'N LIMIT = 0.2	GUIDELINE = 100 (F2)		
FEB	73.400	69.700	71.600	73.000	60.400	61.000
APR	74.800	72.800	74.400	74.000	75.600	73.200
JUN	75.600	73.900	73.400	75.000	78.700	78.000
AUG	81.200	81.100	75.100	72.600	82.200	82.500
OCT	83.600	79.300	82.800	84.000	82.200	83.800
DEC	89.600	90.200	.	.	90.200	90.200
CYANIDE (MG/L)			DET'N LIMIT = 0.001	GUIDELINE = .2 (A1)		
FEB	.003 <T	.004 <T	.	.	.	.
APR	BDL	BDL	.	.	.	.
JUN	BDL	BDL	.	.	.	.
AUG	BDL	BDL	.	.	.	.
OCT	BDL	BDL	.	.	.	.
DEC	BDL	BDL	.	.	.	.
CHLORIDE (MG/L)			DET'N LIMIT = 0.2	GUIDELINE = 250 (A3)		
FEB	42.100	49.500	54.500	53.700	59.100	55.700
APR	47.300	54.100	60.000	59.800	55.300	54.200
JUN	62.500	73.100	67.400	66.300	83.000	82.300
AUG	67.200	75.600	75.000	73.400	80.600	75.300
OCT	36.400	42.500	45.500	45.200	43.000	43.600
DEC	44.000	48.100	.	.	47.000	46.900
COLOUR (HZU)			DET'N LIMIT = 0.5	GUIDELINE = 5 (A3)		
FEB	20.000	5.500	5.500	5.500	6.000	5.000
APR	20.000	5.500	6.000	5.500	6.500	6.000
JUN	18.500	4.500	6.500	6.000	6.000	6.000
AUG	16.000	4.000	5.500	5.500	5.000	5.000
OCT	27.000	8.500	12.500	12.500	12.000	11.500
DEC	23.500	7.000	.	.	8.500	7.500
CONDUCTIVITY (UMHO/CM)			DET'N LIMIT = 1.	GUIDELINE = 400 (F2)		
FEB	580	588	630	632	570	564
APR	611	623	656	657	635	628
JUN	682	713	681	674	775	769
AUG	735	763	726	715	782	764
OCT	629	640	646	614	630	637
DEC	684	693	.	.	697	694

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM BRANTFORD WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
DISS ORG CARBON (MG/L)			DET'N LIMIT = .100	GUIDELINE = 5.0 (A3)		
FEB	5.200	3.900	4.000	3.800	3.400	3.500
APR	5.100	5.000	4.600	5.000	4.900	5.200
JUN	5.000	4.600	4.600	4.500	4.300	4.300
AUG	5.100	4.500	4.500	4.400	4.000	4.200
OCT	6.800	6.100	6.300	6.100	5.800	5.800
DEC	5.700	5.000	.	.	4.500	4.600
FLUORIDE (MG/L)			DET'N LIMIT = 0.01	GUIDELINE = 2.4 (A1)		
FEB	.100	1.120	1.120	1.100	1.160	1.140
APR	.120	.120	.820	.880	.620	.420
JUN	.140	1.180	1.160	1.180	.980	.980
AUG	.160	1.140	1.280	1.360	1.100	1.120
OCT	.120	1.120	.780	.740	1.120	1.120
DEC	.120	1.100	.	.	.880	.860
HARDNESS (MG/L)			DET'N LIMIT = 0.5	GUIDELINE = 80-100 (A4)		
FEB	257.700	246.700	248.000	253.000	204.000	207.000
APR	271.000	263.000	270.000	268.000	270.000	264.000
JUN	272.400	267.700	264.200	266.000	287.700	285.100
AUG	295.400	296.500	282.100	273.200	303.200	303.100
OCT	300.900	289.700	296.100	299.400	288.800	296.400
DEC	317.000	319.000	.	.	319.000	320.000
IONCAL (DMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = N/A		
FEB	1.218	1.333	1.469	.868	.398	1.541
APR	1.903	.524	1.227	1.062	.604	.492
JUN	3.550	3.589	4.182	5.195	3.343	3.369
AUG	2.991	4.772	1.416	1.198	.122	2.676
OCT	1.890	.086	.912	5.510	.992	3.395
DEC	.400	.507	.	.	.292	.477
LANGELIERS INDEX (DMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = N/A		
FEB	.997	.632	.433	.384	.180	.117
APR	1.068	.959	.812	.788	.941	.919
JUN	1.077	.924	.918	.939	1.000	.946
AUG	1.046	.681	.854	.752	.933	.841
OCT	1.148	.832	1.129	.991	1.004	.944
DEC	1.210	.812	.	.	.868	.837
MAGNESIUM (MG/L)			DET'N LIMIT = 0.10	GUIDELINE = 30 (F2)		
FEB	18.100	17.600	17.000	17.200	12.900	13.200
APR	20.400	19.700	20.400	20.300	19.600	19.700
JUN	20.300	20.200	19.650	19.100	22.150	21.950
AUG	22.550	22.850	23.000	22.300	23.750	23.600
OCT	22.400	22.250	21.700	21.800	20.300	21.150
DEC	23.400	22.800	.	.	22.900	22.900

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM BRANTFORD WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
SODIUM (MG/L)			DET'N LIMIT = 0.2	GUIDELINE = 200 (A4)		
FEB	20.300	23.300	27.400	26.800	31.000	28.000
APR	26.000	26.600	32.400	32.600	27.200	26.400
JUN	40.200	44.500	40.600	39.500	51.000	50.900
AUG	43.200	46.400	41.500	40.800	44.100	42.500
OCT	17.300	18.300	21.400	21.400	19.900	20.300
DEC	22.800	22.800	.	.	22.200	22.000
AMMONIUM TOTAL (MG/L)			DET'N LIMIT = 0.002	GUIDELINE = 0.05 (F2)		
FEB	.394	.146	.184	.216	.154	.164
APR	.006 <T	.104	.166	.198	.040	.116
JUN	.042	.172	BDL	BDL	BDL	.086
AUG	.056	.176	.132	.190	.016	.018
OCT	.046	.208	.018	.006 <T	.002 <T	.034
DEC	.158	.128	.	.	BDL	.052
NITRITE (MG/L)			DET'N LIMIT = 0.001	GUIDELINE = 1 (A1)		
FEB	.038	.005	.005	.004 <T	.029	.005
APR	.074	.001 <T	.011	.004 <T	.059	.007
JUN	.087	.011	.016	.012	.083	.074
AUG	.016	.002 <T	.090	.061	.003 <T	.029
OCT	.063	.003 <T	.002 <T	.002 <T	BDL	.019
DEC	.058	.003 <T	.	.	.022	.020
TOTAL NITRATES (MG/L)			DET'N LIMIT = 0.005	GUIDELINE = 10 (A1)		
FEB	3.270	3.690	3.330	3.340	3.180	2.880
APR	3.250	3.240	3.140	3.160	3.450	3.340
JUN	2.200	2.210	2.440	2.420	2.310	2.300
AUG	1.420	1.590	1.640	1.570	1.890	1.770
OCT	3.220	3.280	3.320	3.310	3.380	3.390
DEC	3.650	3.730	.	.	4.240	4.140
NITROGEN TOT KJELD (MG/L)			DET'N LIMIT = 0.02	GUIDELINE = N/A		
FEB	1.110	.580	.690	.680	.620	.620
APR	.820	.660	.740	.800	.630	.700
JUN	.900	.670	.490	.470	.570	.620
AUG	.810	.600	.630	.690	.430	.470
OCT	.950	.790	.690	.630	.630	.670
DEC	.800	.630	.	.	.480	.560
PH (DIMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = 6.5-8.5(A4)		
FEB	8.350	8.110	7.880	7.820	7.800	7.720
APR	8.390	8.340	8.190	8.170	8.300	8.300
JUN	8.430	8.350	8.340	8.350	8.380	8.330
AUG	8.350	8.050	8.270	8.190	8.260	8.180
OCT	8.350	8.110	8.380	8.260	8.270	8.200
DEC	8.340	7.980	.	.	8.040	8.010

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DRINKING WATER SURVEILLANCE PROGRAM BRANTFORD WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
PHOSPHORUS FIL REACT (MG/L)			DET'N LIMIT = 0.0005	GUIDELINE = N/A		
FEB	.064	.002	.	.	.	.
APR	.006	.002 <T	.	.	.	.
JUN	.007	.001 <T	.	.	.	.
AUG	.011	.001 <T	.	.	.	.
OCT	.031	.006	.	.	.	.
DEC	.027	.004	.	.	.	.
PHOSPHORUS TOTAL (MG/L)			DET'N LIMIT = 0.002	GUIDELINE = .40 (F2)		
FEB	.116	.009 <T	.	.	.	.
APR	.062	.016	.	.	.	.
JUN	.073	.008 <T	.	.	.	.
AUG	.061	.008 <T	.	.	.	.
OCT	.104	.009 <T	.	.	.	.
DEC	.058	.010	.	.	.	.
SULPHATE (MG/L)			DET'N LIMIT = .200	GUIDELINE = 500 (A3)		
FEB	48.520	67.120	73.500	74.840	59.170	60.960
APR	52.020	59.380	70.060	70.550	61.800	60.260
JUN	72.920	85.670	77.040	74.670	96.480	95.270
AUG	90.700	104.190	98.500	94.470	101.730	101.230
OCT	44.390	58.040	59.190	59.740	57.740	56.770
DEC	47.440	58.250	.	.	61.330	59.730
TURBIDITY (FTU)			DET'N LIMIT = 0.05	GUIDELINE = 1 (A1)		
FEB	20.000	.930	2.500	1.500	.890	.470
APR	9.900	.680	.920	1.290	.900	.660
JUN	20.000	.960	.450	.400	.500	.370
AUG	8.200	.500	.330	.380	.550	.300
OCT	23.000	.500	.660	.600	.420	.290
DEC	7.900	.790	.	.	.570	.440

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM BRANTFORD WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
METALS						
SILVER (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 50 (A1)		
FEB	BDL	BDL	BDL	BDL	BDL	BDL
APR	BDL	BDL	.060 <T	.060 <T	BDL	BDL
JUN	BDL	BDL	BDL	BDL	.080 <T	BDL
AUG	BDL	BDL	BDL	BDL	.070 <T	BDL
OCT	BDL	BDL	BDL	BDL	.060 <T	BDL
DEC	BDL	BDL	.	.	.060 <T	BDL
ALUMINUM (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 100 (A4)		
FEB	230.000	100.000	390.000	190.000	49.000	46.000
APR	130.000	130.000	100.000	150.000	74.000	97.000
JUN	180.000	58.000	61.000	57.000	53.000	51.000
AUG	110.000	120.000	87.000	87.000	78.000	91.000
OCT	240.000	65.000	110.000	69.000	48.000	47.000
DEC	120.000	110.000	.	.	37.000	31.000
ARSENIC (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 25 (A1)		
FEB	.460 <T	.370 <T	.380 <T	.390 <T	.120 <T	.520 <T
APR	.300 <T	BDL	.230 <T	.270 <T	.250 <T	.150 <T
JUN	.210 <T	.300 <T	BDL	BDL	BDL	.120 <T
AUG	.900 <T	.310 <T	.380 <T	.340 <T	.230 <T	.220 <T
OCT	1.000 <T	.560 <T	.650 <T	.530 <T	.630 <T	.570 <T
DEC	.400 <T	.130 <T	.	.	.170 <T	.200 <T
BARIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 1000 (A2)		
FEB	27.000	23.000	25.000	23.000	21.000	21.000
APR	31.000	27.000	30.000	29.000	28.000	27.000
JUN	33.000	31.000	29.000	30.000	32.000	33.000
AUG	37.000	34.000	33.000	33.000	36.000	35.000
OCT	31.000	25.000	26.000	26.000	25.000	25.000
DEC	27.000	22.000	.	.	23.000	22.000
BORON (UG/L)			DET'N LIMIT = 2.00	GUIDELINE = 5000 (A1)		
FEB	36.000	26.000	35.000	35.000	29.000	29.000
APR	67.000	71.000	82.000	89.000	73.000	68.000
JUN	52.000	53.000	53.000	51.000	68.000	66.000
AUG	83.000	84.000	78.000	78.000	89.000	83.000
OCT	28.000	25.000	26.000	29.000	27.000	27.000
DEC	31.000	21.000	.	.	32.000	31.000
BERYLLIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 6800 (D4)		
FEB	BDL	BDL	BDL	BDL	BDL	BDL
APR	.060 <T	.070 <T	.100 <T	.110 <T	.080 <T	.080 <T
JUN	BDL	BDL	BDL	BDL	BDL	BDL
AUG	.100 <T	.110 <T	.060 <T	.060 <T	.100 <T	.060 <T
OCT	BDL	BDL	BDL	BDL	BDL	BDL
DEC	BDL	BDL	.	.	.060 <T	BDL

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	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CADMIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 5 (A1)		
FEB	BDL	BDL	BDL	BDL	.610	BDL
APR	BDL	BDL	.100 <T	BDL	.110 <T	BDL
JUN	.060 <T	.070 <T	.080 <T	BDL	.130 <T	.080 <T
AUG	BDL	.110 <T	.130 <T	.080 <T	1.000	BDL
OCT	BDL	BDL	BDL	.060 <T	.080 <T	BDL
DEC	BDL	BDL	.	.	.290 <T	BDL
COBALT (UG/L)			DET'N LIMIT = 0.02	GUIDELINE = N/A		
FEB	.120 <T	BDL	BDL	BDL	.150 <T	.040 <T
APR	.320 <T	.150 <T	.260 <T	.260 <T	.180 <T	.240 <T
JUN	.420 <T	.340 <T	.330 <T	.290 <T	.380 <T	.360 <T
AUG	.160 <T	.090 <T	.160 <T	.080 <T	BDL	BDL
OCT	.340 <T	.170 <T	.210 <T	.160 <T	.200 <T	.150 <T
DEC	.220 <T	.210 <T	.	.	.180 <T	.090 <T
CHROMIUM (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = 50 (A1)		
FEB	3.600 <T	2.300 <T	4.700 <T	3.700 <T	2.600 <T	3.000 <T
APR	3.600 <T	3.200 <T	4.000 <T	4.400 <T	3.200 <T	2.800 <T
JUN	3.500 <T	1.800 <T	2.600 <T	3.500 <T	2.900 <T	2.800 <T
AUG	4.200 <T	3.400 <T	3.100 <T	3.000 <T	3.600 <T	3.300 <T
OCT	3.200 <T	1.700 <T	1.300 <T	2.400 <T	2.500 <T	2.500 <T
DEC	3.800 <T	.560 <T	.	.	3.500 <T	3.300 <T
COPPER (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = 1000 (A3)		
FEB	3.600 <T	3.400 <T	17.000	5.500	300.000	15.000
APR	2.800 <T	2.700 <T	16.000	4.300 <T	170.000	10.000
JUN	3.300 <T	2.700 <T	24.000	18.000	99.000	14.000
AUG	2.000 <T	1.700 <T	12.000	9.000	150.000	18.000
OCT	3.000 <T	2.700 <T	16.000	7.700	110.000	15.000
DEC	2.100 <T	1.500 <T	.	.	130.000	13.000
IRON (UG/L)			DET'N LIMIT = 6.00	GUIDELINE = 300 (A3)		
FEB	300.000	24.000 <T	63.000	91.000	15.000 <T	10.000 <T
APR	220.000	BDL	BDL	8.900 <T	BDL	9.300 <T
JUN	300.000	BDL	17.000 <T	24.000 <T	17.000 <T	17.000 <T
AUG	180.000	BDL	11.000 <T	13.000 <T	12.000 <T	12.000 <T
OCT	360.000	7.000 <T	21.000 <T	11.000 <1	14.000 <T	11.000 <T
DEC	150.000	14.000 <T	.	.	7.900 <T	7.700 <T
MERCURY (UG/L)			DET'N LIMIT = 0.02	GUIDELINE = 1 (A1)		
FEB	.030 <T	BDL	.	.	.	.
APR	BDL	BDL	.	.	.	.
JUN	BDL	BDL	.	.	.	.
AUG	BDL	BDL	.	.	.	.
OCT	BDL	.100 <T	.	.	.	.
DEC	BDL	BDL	.	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM BRANTFORD WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
MANGANESE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 50 (A3)		
FEB	28.000	3.000	5.200	4.600	3.800	3.300
APR	43.000	2.400	2.600	3.200	2.400	2.400
JUN	44.000	1.200	2.100	2.300	2.000	1.800
AUG	38.000	.960	2.400	2.600	1.400	1.600
OCT	42.000	1.800	2.800	2.500	1.800	1.900
DEC	17.000	2.300	.	.	1.800	1.700
MOLYBDENUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = N/A		
FEB	.380 <T	.650	.650	.700	.530	.560
APR	.620	.710	.900	1.000	.820	.770
JUN	1.300	2.000	1.700	1.600	2.200	2.200
AUG	2.100	2.500	2.200	2.100	2.000	2.300
OCT	.450 <T	.710	.730	.700	.760	.670
DEC	.560	.750	.	.	.800	.840
NICKEL (UG/L)			DET'N LIMIT = 0.20	GUIDELINE = 350 (D3)		
FEB	BDL	BDL	BDL	BDL	.960 <T	BDL
APR	2.000 <T	.250 <T	1.400 <T	BDL	1.600 <T	.440 <T
JUN	1.800 <T	.800 <T	1.900 <T	1.800 <T	3.000	1.900 <T
AUG	1.900 <T	1.400 <T	2.700	1.500 <T	2.600	1.800 <T
OCT	2.200	1.600 <T	1.700 <T	1.100 <T	2.900	1.200 <T
DEC	1.300 <T	.580 <T	.	.	1.400 <T	.760 <T
LEAD (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 10. (A1)		
FEB	1.600	.210 <T	.950	.320 <T	42.000	1.800
APR	1.300	.180 <T	1.000	.430 <T	51.000	3.300
JUN	2.000	.130 <T	.950	.520	41.000	4.500
AUG	1.200	.100 <T	.940	.520	60.000	5.700
OCT	1.800	.130 <T	.800	.390 <T	12.000	2.100
DEC	1.100	.080 <T	.	.	16.000	1.500
ANTIMONY (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 146 (D4)		
FEB	.310 <T	.420 <T	.710	.500 <T	.650	.590
APR	.440 <T	.460 <T	.580	.630	.530	.490 <T
JUN	.540	.810	.790	.620	.810	.900
AUG	.520	.560	.650	.680	.700	.630
OCT	.320 <T	.450 <T	.570	.570	.600	.500 <T
DEC	.390 <T	.430 <T	.	.	.530	.470 <T
SELENIUM (UG/L)			DET'N LIMIT = 1.00	GUIDELINE = 10 (A1)		
FEB	BDL	BDL	BDL	BDL	BDL	1.300 <T
APR	BDL	1.200 <T	1.800 <T	2.600 <T	BDL	BDL
JUN	BDL	1.900 <T	2.300 <T	1.400 <T	1.200 <T	1.700 <T
AUG	BDL	BDL	1.500 <T	1.300 <T	BDL	2.400 <T
OCT	BDL	BDL	BDL	BDL	BDL	BDL
DEC	BDL	BDL	.	.	BDL	BDL

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	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
STRONTIUM (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = N/A		
FEB	290.000	260.000	300.000	300.000	220.000	220.000
APR	380.000	370.000	390.000	390.000	390.000	380.000
JUN	570.000	600.000	540.000	540.000	670.000	670.000
AUG	730.000	750.000	710.000	690.000	780.000	780.000
OCT	310.000	290.000	310.000	310.000	300.000	300.000
DEC	330.000	320.000	.	.	320.000	320.000
TITANIUM (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = N/A		
FEB	14.000	9.500	12.000	10.000	8.500	8.600
APR	25.000	20.000	15.000	15.000	22.000	21.000
JUN	18.000	14.000	14.000	14.000	15.000	15.000
AUG	16.000	11.000	11.000	11.000	12.000	12.000
OCT	11.000	6.800	7.100	7.000	7.000	6.700
DEC	12.000	8.900	.	.	8.100	8.300
URANIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 100 (A1)		
FEB	.530	.670	.730	.720	.460 <T	.470 <T
APR	.660	.830	.820	.920	.870	.870
JUN	.560	.590	.610	.550	.700	.690
AUG	.590	.640	.680	.590	.720	.710
OCT	.990	1.100	1.200	1.200	1.100	1.100
DEC	1.100	1.100	.	.	1.000	1.000
VANADIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = N/A		
FEB	1.000	2.300	2.400	2.300	1.900	2.100
APR	.660	1.100	1.100	1.200	1.300	1.200
JUN	1.100	1.400	1.500	1.400	1.400	1.500
AUG	1.200	1.500	1.300	1.400	1.300	1.500
OCT	1.200	1.700	1.700	1.700	1.700	1.700
DEC	.730	1.200	.	.	1.400	1.300
ZINC (UG/L)			DET'N LIMIT = 0.20	GUIDELINE = 5000 (A3)		
FEB	13.000	7.400	32.000	8.400	83.000	8.300
APR	9.900	4.100	13.000	4.800	34.000	4.300
JUN	14.000	7.700	25.000	9.000	23.000	9.100
AUG	8.200	4.500	23.000	6.100	48.000	7.100
OCT	12.000	4.300	24.000	5.900	19.000	5.700
DEC	7.500	4.000	.	.	21.000	5.700

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	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CHLOROAROMATICS						
HEXACHLOROETHANE (NG/L)			DET'N LIMIT = 1.000	GUIDELINE = 1900 (D4)		
FEB	BDL	BDL	.	BDL	.	BDL
APR	BDL	BDL	.	BDL	.	BDL
JUN	BDL	BDL	.	BDL	.	BDL
AUG	BDL	BDL	.	!!S	.	BDL
OCT	BDL	BDL	.	BDL	.	BDL
DEC	BDL	5.000 <T	.	.	.	BDL
HEXACLCYCLOPENTADIEN (NG/L)			DET'N LIMIT = 5.000	GUIDELINE = 206000 (D4)		
OCT	BDL	BDL	.	40.000 <T	.	40.000 <T
DEC	BDL	BDL	.	.	.	BDL

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		WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
		RAW	TREATED	SITE 1		SITE 2	
				STANDING	FREE FLOW	STANDING	FREE FLOW
	PAH						
BENZO(K)	FLUORANTHEN (NG/L)			DET'N LIMIT = 1.	GUIDELINE = N/A		
FEB	BDL	BDL		.	.	.	.
APR	BDL	BDL		.	.	.	.
JUN	2.000 <T	BDL		.	.	.	.
AUG	BDL	BDL		.	BDL	.	BDL
OCT	1.000 <T	BDL		.	.	.	.
DEC	BDL	BDL		.	.	.	.

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	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
PESTICIDES & PCB						
ALPHA BHC (NG/L)			DET'N LIMIT = 1.000	GUIDELINE = 700 (G)		
FEB	BDL	BDL	.	BDL	.	BDL
APR	BDL	BDL	.	BDL	.	BDL
JUN	BDL	3.000 <T	.	1.000 <T	.	2.000 <T
AUG	BDL	BDL	.	!!S	.	BDL
OCT	BDL	BDL	.	BDL	.	1.000 <T
DEC	BDL	BDL	.	.	.	BDL
LINDANE (NG/L)			DET'N LIMIT = 1.000	GUIDELINE = 4000 (A1)		
FEB	BDL	BDL	.	2.000 <T	.	1.000 <T
APR	2.000 <T	2.000 <T	.	3.000 <T	.	1.000 <T
JUN	BDL	3.000 <T	.	3.000 <T	.	3.000 <T
AUG	2.000 <T	BDL	.	!!S	.	2.000 <T
OCT	BDL	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	.	.	BDL
ATRAZINE (NG/L)			DET'N LIMIT = 50	GUIDELINE = 60000 (A2)		
FEB	360.000 <T	340.000 <T	.	.	.	.
APR	BDL	BDL	.	.	.	.
JUN	280.000 <T	250.000 <T	.	.	.	.
AUG	300.000 <T	210.000 <T	.	.	.	.
OCT	BDL	BDL	.	.	.	.
DEC	180.000 <T	200.000 <T	.	.	.	.
DESETHYLATRAZINE (NG/L)			DET'N LIMIT = 200.0	GUIDELINE = 60000 (A)		
FEB	BDL	BDL	.	.	.	.
APR	BDL	BDL	.	.	.	.
JUN	BDL	BDL	.	.	.	.
AUG	BDL	BDL	.	.	.	.
OCT	BDL	BDL	.	.	.	.
DEC	280.000 <T	300.000 <T	.	.	.	.
SIMAZINE (NG/L)			DET'N LIMIT = 50.000	GUIDELINE = 10000 (A2)		
FEB	BDL	BDL	.	.	.	.
APR	BDL	BDL	.	.	.	.
JUN	90.000 <T	80.000 <T	.	.	.	.
AUG	BDL	BDL	.	.	.	.
OCT	BDL	BDL	.	.	.	.
DEC	BDL	BDL	.	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM BRANTFORD WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
PHENOLICS (UG/L PHENOLICS)			DET'N LIMIT = .2	GUIDELINE = 2	(A4)	
FEB	1.600	1.600	.	.	.	.
APR	.400 <T	BDL	.	.	.	.
JUN	.400 <T	.600 <T	.	.	.	.
AUG	BDL	.600 <T	.	.	.	.
OCT	.800 <T	BDL	.	.	.	.
DEC	1.000	1.000	.	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM BRANTFORD WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
VOLATILES						
BENZENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 5 (A1)		
FEB	BDL	BDL	.	.100 <T	.	.050 <T
APR	BDL	BDL	.	BDL	.	BDL
JUN	BDL	.150 <T	.	BDL	.	BDL
AUG	BDL	BDL	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	.	.	BDL
TOLUENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 24 (A3)		
FEB	BDL	.050 <T	.	BDL	.	.100 <T
APR	.050 <T	.150 <T	.	.200 <T	.	.100 <T
JUN	BDL	BDL	.	BDL	.	BDL
AUG	BDL	BDL	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	BDL
DEC	BDL	.050 <T	.	.	.	BDL
ETHYLBENZENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 2.4 (A3)		
FEB	BDL	.050 <T	.	.150 <T	.	.100 <T
APR	BDL	.100 <T	.	.200 <T	.	BDL
JUN	BDL	.500 <T	.	BDL	.	.150 <T
AUG	BDL	BDL	.	.100 <T	.	BDL
OCT	BDL	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	.	.	.050 <T
O-XYLENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 300 (A3*)		
FEB	BDL	BDL	.	.050 <T	.	BDL
APR	BDL	BDL	.	BDL	.	BDL
JUN	BDL	BDL	.	BDL	.	BDL
AUG	BDL	BDL	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	.	.	BDL
STYRENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 100 (D1)		
FEB	.100 <T	.050 <T	.	.150 <T	.	.100 <T
APR	BDL	.150 <T	.	.150 <T	.	.050 <T
JUN	BDL	.400 <T	.	.050 <T	.	.200 <T
AUG	BDL	BDL	.	.050 <T	.	BDL
OCT	BDL	BDL	.	.050 <T	.	BDL
DEC	BDL	.050 <T	.	.	.	.050 <T
CHLOROFORM (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 350 (A1+)		
FEB	BDL	86.500	.	87.700	.	85.700
APR	.200 <T	145.800	.	148.000	.	140.000
JUN	.200 <T	150.100	.	159.100	.	156.500
AUG	.200 <T	161.000	.	146.600	.	148.000
OCT	BDL	146.200	.	151.000	.	137.700
DEC	BDL	92.300	.	.	.	79.300

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM BRANTFORD WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
111, TRICHLOROETHANE (UG/L)			DET'N LIMIT = 0.02	GUIDELINE = 200 (D1)		
FEB	BDL	BDL	.	BDL	.	BDL
APR	.040 <T	BDL	.	BDL	.	BDL
JUN	BDL	BDL	.	BDL	.	BDL
AUG	BDL	BDL	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	BDL
DEC	.040 <T	BDL	.	.	.	BDL
1,2 DICHLOROETHANE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 5 (A1)		
FEB	BDL	BDL	.	BDL	.	BDL
APR	BDL	BDL	.	BDL	.	BDL
JUN	BDL	BDL	.	BDL	.	.150 <T
AUG	BDL	BDL	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	.	.	BDL
DICHLOROBROMOMETHANE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 350 (A1+)		
FEB	BDL	6.200	.	6.850	.	5.900
APR	BDL	13.250	.	16.200	.	13.800
JUN	BDL	21.600	.	20.950	.	24.050
AUG	BDL	24.850	.	21.400	.	23.900
OCT	BDL	10.900	.	11.250	.	10.300
DEC	BDL	9.150	.	.	.	8.500
CHLORODIBROMOMETHANE (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 350 (A1+)		
FEB	BDL	.200 <T	.	.300 <T	.	.200 <T
APR	BDL	.600 <T	.	.800 <T	.	.700 <T
JUN	BDL	1.600	.	1.400	.	1.800
AUG	BDL	2.300	.	1.700	.	2.000
OCT	BDL	.300 <T	.	.400 <T	.	.300 <T
DEC	BDL	.400 <T	.	.	.	.300 <T
T-CHLOROETHYLENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 5 (D1)		
FEB	BDL	BDL	.	BDL	.	BDL
APR	BDL	BDL	.	BDL	.	BDL
JUN	BDL	BDL	.	BDL	.	BDL
AUG	BDL	BDL	.	BDL	.	.050 <T
OCT	BDL	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	.	.	BDL
TOTL TRIHALOMETHANES (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = 350 (A1)		
FEB	BDL	92.900	.	94.750	.	91.850
APR	BDL	159.700	.	165.000	.	154.900
JUN	BDL	173.300	.	181.450	.	182.350
AUG	BDL	188.100	.	169.700	.	173.950
OCT	BDL	157.400	.	162.600	.	148.250
DEC	BDL	101.850	.	.	.	88.150

TRACE LEVELS OF TOLUENE ARE LABORATORY ARTIFACTS DERIVED FROM THE ANALYTICAL METHODOLOGY.

TRACE LEVELS OF STYRENE ARE CONSIDERED TO BE LABORATORY ARTIFACTS RESULTING FROM THE LABORATORY SHIPPING CONTAINERS.

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
BACTERIOLOGICAL			
FECAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	0 (A1)
STANDARD PLATE COUNT MEMBRANE FILT.	CT/ML	0	500/ML (A3)
TOTAL COLIFORM BACKGROUND MF	CT/100ML	0	N/A
TOTAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	5/100ML (A1)
CHEMISTRY (FLD)			
FIELD COMBINED CHLORINE RESIDUAL	MG/L	0	N/A
FIELD TOTAL CHLORINE RESIDUAL	MG/L	0	N/A
FIELD FREE CHLORINE RESIDUAL	MG/L	0	N/A
FIELD PH	DMNSLESS	N/A	6.5-8.5 (A3)
FIELD TEMPERATURE	DEG.C	N/A	15.0 (A3)
FIELD TURBIDITY	FTU	N/A	1.0 (A1)
CHEMISTRY (LAB)			
ALKALINITY	MG/L	0.2	30-500 (A3)
AMMONIUM TOTAL	MG/L	0.002	0.05 (F2)
CALCIUM	MG/L	0.2	100 (F2)
CHLORIDE	MG/L	0.2	250 (A3)
COLOUR	TCU	0.5	5.0 (A3)
CONDUCTIVITY	UMHO/CM	1.0	400 (F2)
CYANIDE	MG/L	0.001	0.2 (A1)
DISSOLVED ORGANIC CARBON	MG/L	0.1	5.0 (A3)
FLUORIDE	MG/L	0.01	2.4 (A1)
HARDNESS	MG/L	0.5	80-100 (A4)
LANGELIERS INDEX	DMNSLESS	N/A	N/A
MAGNESIUM	MG/L	0.1	30.0 (F2)
NITRITE	MG/L	0.001	1.0 (A1)
NITROGEN TOTAL KJELDAHL	MG/L	0.02	N/A
PH	DMNSLESS	N/A	6.5-8.5 (A4)
PHOSPHORUS FIL REACT	MG/L	0.0005	N/A
PHOSPHORUS TOTAL	MG/L	0.002	0.4 (F2)
SODIUM	MG/L	0.2	200 (A4)
SULPHATE	MG/L	0.2	500 (A3)
TOTAL NITRATES	MG/L	0.005	10.0 (A1)
TURBIDITY	FTU	0.05	1.0 (A1)
CHLOROAROMATICS			
123 TRICHLOROBENZENE	NG/L	5.0	N/A
1234 TETRACHLOROBENZENE	NG/L	1.0	N/A
1235 TETRACHLOROBENZENE	NG/L	1.0	N/A
124 TRICHLOROBENZENE	NG/L	5.0	10000 (I)
1245-TETRACHLOROBENZENE	NG/L	1.0	38000 (D4)
135 TRICHLOROBENZENE	NG/L	5.0	N/A
236 TRICHLOROTOLUENE	NG/L	5.0	N/A
245 TRICHLOROTOLUENE	NG/L	5.0	N/A
26A TRICHLOROTOLUENE	NG/L	5.0	N/A
HEXACHLOROBENZENE	NG/L	1.0	10 (C1)
HEXACHLOROBUTADIENE	NG/L	1.0	450 (D4)
HEXACHLOROCYCLOPENTADIENE	NG/L	5.0	206000 (D4)
HEXACHLOROETHANE	NG/L	1.0	1900 (D4)
OCTACHLOROSTYRENE	NG/L	1.0	N/A
PENTACHLOROBENZENE	NG/L	1.0	74000 (D4)
CHLOROPHENOLS			
234 TRICHLOROPHENOL	NG/L	100.0	N/A
2345 TETRACHLOROPHENOL	NG/L	20.0	N/A
2356 TETRACHLOROPHENOL	NG/L	10.0	N/A

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
245 TRICHLOROPHENOL	NG/L	100.0	2600000 (D4)
246 TRICHLOROPHENOL	NG/L	20.0	5000 (A1)
PENTACHLOROPHENOL	NG/L	10.0	60000 (A1)
METALS			
ALUMINUM	UG/L	0.10	100 (A4)
ANTIMONY	UG/L	0.05	146 (D4)
ARSENIC	UG/L	0.10	25 (A1)
BARIUM	UG/L	0.05	1000 (A2)
BERYLLIUM	UG/L	0.05	6800 (D4)
BORON	UG/L	2.00	5000 (A1)
CADMIUM	UG/L	0.05	5 (A1)
CHROMIUM	UG/L	0.50	50 (A1)
COBALT	UG/L	0.02	N/A
COPPER	UG/L	0.50	1000 (A3)
IRON	UG/L	6.00	300 (A3)
LEAD	UG/L	0.05	10 (A1)
MANGANESE	UG/L	0.05	50 (A3)
MERCURY	UG/L	0.02	1 (A1)
MOLYBDENUM	UG/L	0.05	N/A
NICKEL	UG/L	0.20	350 (D3)
SELENIUM	UG/L	1.00	10 (A1)
SILVER	UG/L	0.05	50 (A1)
STRONTIUM	UG/L	0.10	N/A
THALLIUM	UG/L	0.05	13 (D4)
TITANIUM	UG/L	0.50	N/A
URANIUM	UG/L	0.05	100 (A1)
VANADIUM	UG/L	0.05	N/A
ZINC	UG/L	0.20	5000 (A3)
PAH			
ANTHRACENE	NG/L	1.0	N/A
BENZO(A) ANTHRACENE	NG/L	20.0	N/A
BENZO(A) PYRENE	NG/L	5.0	10.0 (A1)
BENZO(B) CHRYSENE	NG/L	2.0	N/A
BENZO(B) FLUORANTHENE	NG/L	10.0	N/A
BENZO(E) PYRENE	NG/L	50.0	N/A
BENZO(G,H,I) PERYLENE	NG/L	20.0	N/A
BENZO(K) FLUORANTHENE	NG/L	1.0	N/A
CHRYSENE	NG/L	50.0	N/A
CORONENE	NG/L	10.0	N/A
DIBENZO(A,H) ANTHRACENE	NG/L	10.0	N/A
DIMETHYL BENZO(A) ANTHRACENE	NG/L	5.0	N/A
FLUORANTHENE	NG/L	20.0	42000.0 (D4)
INDENO(1,2,3-C,D) PYRENE	NG/L	20.0	N/A
PERYLENE	NG/L	10.0	N/A
PHENANTHRENE	NG/L	10.0	N/A
PYRENE	NG/L	20.0	N/A
PESTICIDES & PCB			
ALACHLOR (LASSO)	NG/L	500.0	5000 (A2)
ALDRIN	NG/L	1.0	700 (A1)
ALPHA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	700 (G)
ALPHA CHLORDANE	NG/L	2.0	7000 (A1)
AMETRINE	NG/L	50.0	300000 (D3)
ATRATONE	NG/L	50.0	N/A
ATRAZINE	NG/L	50.0	60000 (A2)
DES ETHYL ATRAZINE	NG/L	200.0	60000 (A2)
BETA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	300 (G)
CYANAZINE (BLADEX)	NG/L	100.0	10000 (A2)
O,P-DDD	NG/L	5.0	10 (I)
DIELDRIN	NG/L	2.0	700 (A1)
ENDOSULFAN 1 (THIODAN I)	NG/L	2.0	74000 (D4)
ENDOSULFAN 2 (THIODAN II)	NG/L	5.0	74000 (D4)

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
ENDOSULFAN SULPHATE (THIODAN SULPHATE)	NG/L	5.0	N/A
ENDRIN	NG/L	5.0	1600 (D3)
GAMMA CHLORDANE	NG/L	2.0	7000 (A1)
HEPTACHLOR	NG/L	1.0	3000 (A1)
HEPTACHLOR EPOXIDE	NG/L	1.0	3000 (A1)
LINDANE (GAMMA BHC)	NG/L	1.0	4000 (A1)
METHOXYCHLOR	NG/L	5.0	900000 (A1)
METOLACHLOR	NG/L	500.0	50000 (A2)
METRIBUZIN (SENCOR)	NG/L	100.0	80000 (A1)
MIREX	NG/L	5.0	N/A
P,P-DDD	NG/L	5.0	N/A
O,P-DDT	NG/L	5.0	30000 (A1)
OXYCHLORDANE	NG/L	2.0	N/A
PCB	NG/L	20.0	3000 (A2)
PPDDE	NG/L	1.0	30000 (A1)
PPDDT	NG/L	5.0	30000 (A1)
PROMETONE	NG/L	50.0	52500 (D3)
PROMETRYNE	NG/L	50.0	1000 (A2)
PROPAZINE	NG/L	50.0	700000 (D3)
SIMAZINE	NG/L	50.0	10000 (A2)
D-ETHYL SIMAZINE	NG/L	200.0	10000 (A2)
TOXAPHENE	NG/L	500.0	5000 (A1)
PHENOLICS			
PHENOLICS (UNFILTERED REACTIVE)	UG/L	0.2	2 (A4)
SPECIFIC PESTICIDES			
2,4 D PROPIONIC ACID	NG/L	100.	N/A
2,4,5-TRICHLOROPHENOXY ACETIC ACID	NG/L	50.	280000 (A1)
2,4-DICHLOROBUTYRIC ACID (2,4-D)	NG/L	100.	100000 (A1)
24-DICHLORORPHENOXYBUTYRIC ACID (24-DB)	NG/L	200.	18000 (B3)
BUTYLATE (SUTAN)	NG/L	2000.	245000 (D3)
CARBARYL (SEVIN)	NG/L	200.	90000 (A1)
CARBOFURAN	NG/L	2000.	90000 (A1)
CHLORPYRIFOS (DURSBAN)	NG/L	20.	N/A
CICP (CHLORPROPHAM)	NG/L	2000.	350000 (G)
DIALLATE	NG/L	2000.	N/A
DIAZINON	NG/L	20.	20000 (A1)
DICAMBA	NG/L	50.	120000 (A1)
DICHLOROVOS	NG/L	20.	N/A
EPTAM	NG/L	2000.	N/A
ETHION	NG/L	20.	35000 (G)
IPC	NG/L	2000.	N/A
MALATHION	NG/L	20.	190000 (A1)
METHYL PARATHION	NG/L	50.	7000 (B3)
METHYLTRITHION	NG/L	20.	N/A
MEVINPHOS	NG/L	20.	N/A
PARATHION	NG/L	20.	50000 (A1)
PHORATE (THIMET)	NG/L	20.	2000 (A2)
PROPOXUR (BAYGON)	NG/L	2000.	140000 (D3)
RELDAN	NG/L	20.	N/A
RONNEL	NG/L	20.	N/A
SILVEX (2,4,5-TP)	NG/L	20.	10000 (A1)
VOLATILES			
1,1 DICHLOROETHANE	UG/L	0.10	N/A
1,1 DICHLOROETHYLENE	UG/L	0.10	7 (D1)
1,2 DICHLOROBENZENE	UG/L	0.05	200 (A1)
1,2 DICHLOROETHANE	UG/L	0.05	5 (A1)

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
1,2 DICHLOROPROPANE	UG/L	0.05	5 (D1)
1,3 DICHLOROBENZENE	UG/L	0.10	3750 (D3)
1,4 DICHLOROBENZENE	UG/L	0.10	5 (A1)
111, TRICHLOROETHANE	UG/L	0.02	200 (D1)
112 TRICHLOROETHANE	UG/L	0.05	0.6 (D4)
1122 TETRACHLOROETHANE	UG/L	0.05	0.17(D4)
BENZENE	UG/L	0.05	5 (A1)
BROMOFORM	UG/L	0.20	350 (A1+)
CARBON TETRACHLORIDE	UG/L	0.20	5 (A1)
CHLOROBENZENE	UG/L	0.10	1510 (D3)
CHLORODIBROMOMETHANE	UG/L	0.10	350 (A1+)
CHLOROFORM	UG/L	0.10	350 (A1+)
DICHLOROBROMOMETHANE	UG/L	0.05	350 (A1+)
ETHLYENE DIBROMIDE	UG/L	0.05	50 (D1)
ETHYLBENZENE	UG/L	0.05	2.4 (A3)
M-XYLENE	UG/L	0.10	300 (A3*)
METHYLENE CHLORIDE	UG/L	0.50	50 (A1)
O-XYLENE	UG/L	0.05	300 (A3*)
P-XYLENE	UG/L	0.10	300 (A3*)
STYRENE	UG/L	0.05	100 (D1)
TETRACHLOROETHYLENE	UG/L	0.05	5 (D1)
TRANS 1,2 DICHLOROETHYLENE	UG/L	0.10	70 (D1)
TOLUENE	UG/L	0.05	24 (A3)
TOTAL TRIHALOMETHANES	UG/L	0.50	350 (A1)
TRICHLOROETHYLENE	UG/L	0.10	50 (A1)

Appendix A

DRINKING WATER SURVEILLANCE PROGRAM
PROGRAM DESCRIPTION

The Drinking Water Surveillance Program (DWSP) for Ontario monitors drinking water quality at municipal water supply systems. The DWSP Database Management System provides a computerized drinking water quality information system for the supplies monitored. The objectives of the program are to provide:

- immediate, reliable, current information on drinking water quality;
- a flagging mechanism for guideline exceedance;
- a definition of contaminant levels and trends;
- a comprehensive background for remedial action;
- a framework for assessment of new contaminants; and
- an indication of treatment efficiency of plant processes.

PROGRAM

The DWSP officially began in April 1986 and is designed to eventually include all municipal water supplies in Ontario. In 1990, 76 systems were being monitored. Water supply locations have been prioritized for surveillance based primarily on criteria such as population density, probability of contamination and geographical location.

An ongoing assessment of future monitoring requirements at each location will be made. Monitoring will continue at the initial locations at an appropriate level and further locations will be phased into the program as resources permit.

A major goal of the program is to collect valid water quality data in context with plant operational characteristics at the time of sampling. As soon as sufficient data have been accumulated and analyzed, both the frequency of sampling and the range of parameters may be adjusted accordingly.

Assessments are carried out at all locations prior to initial sampling, in order to acquire complete plant process and distribution system details and to designate (and retrofit if necessary) all sampling systems and locations. This ensures that the sampled water is a reflection of the water itself.

Samples are taken of raw (ambient water) and treated water at the treatment plant and of consumer's tap water in the distribution system. In order to determine possible effects of distribution on water quality, both standing and free flow water in old and new sections of the distribution system are sampled. Sampling is carried out by operational personnel who have been trained in applicable procedures.

Comprehensive standardized procedures and field test kits are supplied to sampling personnel. This ensures that samples are taken and handled according to standard protocols and that field testing will supply reliable data. All field and laboratory analyses are carried out using "approved documented procedures". Most laboratory analyses are carried out by the Ministry of Environment (MOE), Laboratory Services Branch. Radionuclides are analyzed by the Ministry of Labour.

DATA REPORTING MECHANISM

When the analytical results are transferred from the MOE laboratory into the DWSP system, printouts of the completed analyses are sent to the MOE District Officer, the appropriate operational staff and are also retained by the DWSP unit.

PROGRAM INPUTS AND OUTPUTS

There are four major inputs and four major outputs in the program.

Program Input - Plant and Distribution System Description

The system description includes plant specific non-analytical information acquired through a questionnaire and an initial plant visit. During the initial assessment of the plant and distribution system, questionnaire content is verified and missing information added. It is intended that all data be kept current with scheduled annual updates.

The Plant and Distribution System Description consists of the following seven components:

1. PROCESS COMPONENT INVENTORY

All physical and chemical processes to which the water is subjected, from the intake pipe to the consumers' tap (where possible), are documented. These include: process type, general description of physical structures, material types, sizes, and retention time for each process within the plant. The processes may be as simple as transmission or as complex as carbon adsorption.

2. TREATMENT CHEMICALS

Chemicals used in the treatment processes, their function, application point, supplier and brand-name are recorded. Chemical dosages applied on the day of sampling are recorded in DWSP.

3. PROCESS CONTROL MEASUREMENTS

Documentation of in-plant monitoring of process parameters (eg. turbidity, chlorine residuals, pH, aluminum residuals) including methods used, monitoring locations and frequency is contained in this section. Except for the recorded Field Data, in-plant monitoring results are not retained in DWSP but are retained by the water treatment plant personnel.

4. DESIGN FLOW AND RETENTION TIME

Hydraulic capacity, designed and actual, is noted here. Retention time (the time that a block of water is retained in the plant) is also noted. Maximum, minimum and average flow, as well as a record of the flow rate on the day of sampling, are recorded in DWSP.

5. DISTRIBUTION SYSTEM DESCRIPTION

This area includes the storage and transmission characteristics of the distribution system after the water leaves the plant.

6. SAMPLING SYSTEM

Each plant is assessed for its adequacy in terms of the sampling of bacteriological, organic and inorganic parameters. Prime considerations in the assessment and design of the sampling system are:

i/ the sample is an accurate representation of the actual water condition, eg. raw water has had no chemical treatment;

ii/ the water being sampled is not being modified by the sampling system;

iii/ the sample tap must be in a clean area of the plant, preferably a lab area; and

iv/ the sample lines must be organically inert (no plastic, ideally stainless steel).

It is imperative that the sampled water be a reflection not of the sampling system but of the water itself.

The sampling system documentation includes: origin of the water; date sampling was initiated; size, length and material type (intake,

discharge and tap); pump characteristics (model, type, capacity); and flow rate.

7. PERSONNEL
This section contains the names, addresses and phone numbers of current plant management and operational staff, distribution system management and operational staff, Medical Officer of Health and appropriate MOE personnel associated with the plant.

Program Input - Field Data

The second major input to DWSP is field data. Field data is collected at the plant and from the distribution system sites on the day of sampling. Field data consists of general operating conditions and the results of testing for field parameters. General operating conditions include chemicals used, dosages, flow and retention time on the day of sampling, as well as, monthly maximum, minimum and average flows. Field parameters include turbidity, chlorine residuals (free, combined and total), temperature and pH. These parameters are analyzed according to standardized DWSP protocols to allow for interplant comparison.

Program Input - Laboratory Analytical Data

The third major input to DWSP is Laboratory Analytical Data. Samples gathered from the raw, treated and distribution sampling sites are analyzed for the presence of approximately 180 parameters at a frequency of two to twelve times per year. Sixty-five percent of the parameters are organic. Parameters measured may have health or aesthetic implications when present in drinking water. Many of the parameters may be used in the treatment process or may be treatment by-products. Due to the nature of certain analytical instruments, parameters may be measured in a "scan" producing some results for parameters that are not on the DWSP priority list, but which may be of interest. The majority of parameters are measured on a routine basis. Those that are technically more difficult and/or costly to analyze, however, are done less frequently. These include Specific Pesticides and Chlorophenols.

Although the parameter list is extensive, additional parameters with the potential to cause health or aesthetic related problems may be added provided reliable analytical and sampling methods exist.

All laboratory generated data is derived from standardized, documented analytical protocols. The analytical method is an integral part of the data and as methods change, notation will be made and comparison data documented.

Program Input - Parameter Reference Information

The fourth major input to DWSP is Parameter Reference Information. This is a catalogue of information for each substance analyzed on DWSP. It includes parameter name and aliases, physical and chemical properties, basic toxicology, world-wide health limits, treatment methods and uses. The Parameter Reference Information is computerized and can be accessed through the Query function of the DWSP database. An example is shown in figure 1.

Program output - Query

All DWSP information is easily accessed through the Query function, therefore, anything from addresses of plant personnel to complete water quality information for a plant's water supply is instantly available. The DWSP computer system makes relatively complex inquiries manageable. A personal password allowing access into the DWSP query mode in all MOE offices is being developed by the DWSP group.

Program Output - Action Alerts

Drinking Water quality in Ontario is evaluated against provincial objectives as outlined in the Ontario Drinking Water Objectives publication. Should the reported level of a substance in treated water exceed the Ontario Drinking Water Objective, an "Action Alert" requiring resampling and confirmation is issued. This assures that operational staff, health authorities and the public are notified as soon as possible of the confirmation of an exceedance and remedial action taken. This report supplies a history of the occurrence of past exceedances at the plant plus a historical summary on the parameter of concern.

In the absence of Ontario Drinking Water Objectives, guidelines/limits from other agencies are used. The Parameter Listing System, published by MOE (ISBN 0-7729-4461-X), catalogues and keeps current guidelines for 650 parameters from agencies throughout the world. If these guidelines are exceeded, the results are flagged and evaluated by DWSP personnel. An "Action Alert" will be issued if warranted.

Program Output - Report Generation

Custom reports can be generated from DWSP to meet MOE Regional needs and to respond to public requests.

Program Output - Annual Reports

It is the practice of DWSP to produce an annual report containing analytical data along with companion plant information.

FIG.1

MOE - DRINKING WATER ASSESSMENT PROGRAM (DWSP)

PARAMETER REFERENCE INFORMATION

BENZENE (B2001P) VOLATILES

CLASS: HEALTH METHOD: P0C0D0 UNIT: µg/L

SOURCE	FROM	TO	METHOD	GUIDELINE	UNIT	NOTE
CAL C	85/01			0.700	µg/L	AL
CDWG C	87/01			5.000	µg/L	MAC
EPA C	87/07			5.000	µg/L	MCL
EPAA C	80/11			6.600	µg/L	AMBIENT **
FERC C	84/05			1.000	µg/L	MCL
WHO C	84/01			10.000	µg/L	GV

DESCRIPTION:**NAME:** BENZENE
CAS#: 71-43-2
MOLECULAR FORMULAE: C_6H_6
DETECTION LIMIT: (FOR METHOD POCODO) 0.05 µg/L
SYNONYMS: BENZOL; BENZOLE; COAL NAPHTHA; CARBON OIL (27). CYCLOHEXATRIENE (41).
CHARACTERISTICS: COLOURLESS TO LIGHT-YELLOW, MOBILE, NON-POLAR LIQUID, OF HIGHLY REFRACTIVE NATURE, AROMATIC ODOUR; VAPOURS BURN WITH SMOKING FLAME (30).
PROPERTIES: SOLUBILITY IN WATER: 1780-1800 mg/L AT 25C (41). THRESHOLD ODOUR: 0.5 - 10 PPM IN WATERTHRESHOLD TASTE: 0.5 mg/L IN WATER (39).
ENVIRONMENTAL FATE: MAY BIOACCUMULATE IN LIVING ORGANISMS AND APPEARS TO ACCUMULATE IN ANIMAL TISSUES THAT EXHIBIT A HIGH LIPID CONTENT OR REPRESENT MAJOR METABOLIC SITES, SUCH AS LIVER OR BRAIN; SMALL QUANTITIES EVAPORATE FROM SOILS OR ARE DEGRADED RATHER QUICKLY (80).
SOURCES: COMMERCIAL: PETROLEUM REFINING; SOLVENT RECOVERY; COAL TAR DISTILLATION (39); FOOD PROCESSING AND TANNING INDUSTRIES; COMBUSTION OF CAR EXHAUST.
ENVIRONMENTAL: POSSIBLE SOURCE IS RUNOFF.

USES: DETERGENTS; NYLON; INTERMEDIATE IN PRODUCTION OF OTHER COMPOUNDS, SUCH AS PESTICIDES; SOLVENT FOR EXTRACTION AND RECTIFICATION IN RUBBER INDUSTRY; DEGREASING AND CLEANSING AGENT; GASOLINE.

TOXICITY: RATING: 4 (VERY TOXIC).
ACUTE: IRRITATING TO MUCOUS MEMBRANES; SYMPTOMS INCLUDE RESTLESSNESS, CONVULSIONS, EXCITEMENT, DEPRESSION; DEATH MAY FOLLOW RESPIRATORY FAILURE.
CHRONIC: MAY CAUSE ANAEMIA AND LEUKAEMIA (45); MUTAGENIC.
MODE OF ACTION: CHROMOABERRATION IN LYMPHOCYTE CULTURES.

CARCINOGENICITY: A KNOWN HUMAN CARCINOGEN.

REMOVAL: THE FOLLOWING PROCESSES HAVE BEEN SUCCESSFUL IN REMOVING BENZENE FROM WASTEWATER: GAC ADSORPTION, PRECIPITATION WITH ALUM AND SUBSEQUENT REMOVAL VIA SEDIMENTATION, COAGULATION AND FLOCCULATION, SOLVENT EXTRACTION, OXIDATION

ADDITIONAL PROPERTIES:
MOLECULAR WEIGHT: 78.12
MELTING POINT: 5.5°C (27).
BOILING POINT: 80.1°C (27).
SPECIFIC GRAVITY: 0.8790 AT 20°C (27).
VAPOUR PRESSURE: 100 MM AT 26.1°C (27).
HENRY'S LAW CONSTANT: 0.00555 ATM-M3/MOLE (41).
LOG OCT./WATER PARTITION COEFFICIENT: 1.95 TO 2.13 (39).
CARBON ADSORPTION: K=1.0; 1/N=1.6; R=0.97; PH=5.3 (41)SEDIMENT/WATER PARTITION COEFFICIENT: NO DATA

NOTES: EPA PRIORITY POLLUTANT.

Appendix B

DWSP SAMPLING GUIDELINE

i) Raw and Treated at Plant

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Bacteriological	-220 mL plastic bottle with white seal on cap -do <u>not</u> rinse bottle, preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid (HNO_3) (**Caution:** HNO_3 is corrosive)
Volatiles (duplicates) (OPOPUP)	-45 mL glass vial with septum (teflon side must be in contact with sample) -do <u>not</u> rinse bottle -fill bottle completely without bubbles
Organics (OWOC),(OWTRI),(OAPAHX)	-1 L amber glass bottle per scan -do <u>not</u> rinse bottle -fill to 2 cm from top -when 'special pesticides' are requested three extra bottles must be filled

Cyanide	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops sodium hydroxide (NaOH) (**Caution:** NaOH is corrosive)
Mercury	-250 mL glass bottle -rinse bottle and cap three times -fill to top of label -add 20 drops each nitric acid (HNO_3) and potassium dichromate ($K_2Cr_2O_7$) (**Caution:** HNO_3&$K_2Cr_2O_7$ are corrosive)
Phenols	-250 mL glass bottle -do <u>not</u> rinse bottle, preservative has been added -fill to top of label
Radionuclides (as scheduled)	-4 L plastic jug -do <u>not</u> rinse, carrier added -fill to 5 cm from top
Organic Characterization (GC/MS - once per year)	-1 L amber glass bottle; instructions as per organic -250 mL glass bottle -do <u>not</u> rinse bottle -fill completely without bubbles

<u>Steps:</u>

1. Let sampling water tap run for an adequate time to clear the sample line.

2. Record time of day on submission sheet.

3. Record temperature on submission sheet.

4. Fill up all bottles as per instructions.

5. Record chlorine residuals (free, combined and total for treated water only), turbidity and pH on submission sheet.

ii) Distribution Samples (standing water)

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid (HNO_3) (**Caution:** HNO_3 is corrosive)

Steps:

1. Record time of day on submission sheet.
2. Place bucket under tap and open cold water.
3. Fill to predetermined volume.
4. After mixing the water, record the temperature on the submission sheet.
5. Fill general chemistry and metals bottles.
6. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.

iii) Distribution Samples (free flow)

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Bacteriological	-250 mL plastic bottle with white seal on cap -do not rinse bottle, preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked

Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid HNO_3 (**Caution:** HNO_3 is corrosive)
Volatiles (duplicate) (OPOPUP)	-45 mL glass vial with septum (teflon side must be in contact with sample) -do <u>not</u> rinse bottle, preservative has been added -fill bottle completely without bubbles
Organics (OWOC) (OAPAHX)	-1 L amber glass bottle per scan -do <u>not</u> rinse bottle -fill to 2 cm from top

<u>Steps:</u>

1. Record time of day on submission sheet.

2. Let cold water flow for five minutes.

3. Record temperature on submission sheet.

4. Fill all bottles as per instructions.

5. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.